



**Clean Cities International**  
**Better Air Quality 2002 Conference**  
**Hong Kong, China**  
**Trip Report**

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**Summary**

The U.S. Department of Energy (DOE) Clean Cities International (CCI) Program sent a representative to Hong Kong, China to attend the Better Air Quality 2002 (BAQ 2002) conference, December 15-19, 2002. Nancy E. Checklick of Science Applications International Corporation (SAIC) served as consultant and representative for Clean Cities International on this trip, and received additional support from the National Energy Technology Laboratory (NETL). The regional workshop covered technical, policy and institutional aspects related to air quality and its management and control techniques. It is advised to Clean Cities International to 1) follow-up with representatives from India, the Philippines, Thailand, and Bangladesh; 2) build relationships with new private sector stakeholders who approached CCI with interest; 3) work with and leverage funding from other collaborators who approached CCI with interest; 4) consider participation in other international partnerships and institutions; and 5) increase international awareness of CCI. More detailed recommendations and conclusions, and contact information are provided at the end of this document. The BAQ website will post copies of all presentations made at the conference in Late January/early February 2003.

**Background of BAQ 2002**

The regional workshop on Better Air Quality was the third in a series of workshops on air pollution convened in Hong Kong, at the Hong Kong Convention and Exhibition Centre, Wan Chai, Hong Kong Island.

The first workshop, entitled "Diesel Vehicle Exhaust Treatment Technology and Motorcycle Emission Workshop," was held in January 11-12, 1999. The second workshop, entitled "Better Air Quality: Motor Vehicle Control & Technology Workshop," was held in December 18-20, 2000. As the third workshop in this series, BAQ 2002 adopted a stronger regional focus with the main theme to share technological and control experience and information on air quality in the region.



In line with the broadening of the scope of the workshop, the California Air Resources Board (CARB), Clean Air Initiative for Asian Cities (CAI-Asia; a joint secretariat of the World Bank and the Asian Development Bank), and the Air Pollution in Mega Cities of Asia project (APMA) have agreed to co-organize BAQ 2002; along with The Hong Kong Polytechnic University; and the Environmental Protection Department of Hong Kong. Additional funding support for the workshop was donated by the U.S. DOE Clean Cities Program, Asian Development Bank, China Sustainable Energy Program, U.S. Environmental Protection Agency, Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ), the Health Effects Institute, the Ministry of Environment of the Republic of Korea, Sida, U.S.-Asia Environmental Partnership, and the World Bank. Specifically, funding support from the Clean Cities Program included sponsorship of two delegates from Bangladesh, Mr. Ali Nurallah and Mr. Abedin from the Rupantarita Prakritik Gas Company Limited, a subsidiary of Bangladesh Oil, Gas and Mineral Corporation (Petrobangia).

The BAQ 2002 workshop covered technical, policy and institutional aspects related to air quality and its management and control techniques. BAQ 2002 will have sessions dealing with outdoor (stationary and mobile sources) as well as indoor air pollution. The objectives of BAQ 2002 included a review and discussion of the current status of air quality management and control techniques in the region; identification of mechanisms for stakeholders in the region to improve and strengthen cooperation in air quality management and control strategies; exposure to new technological developments innovative and effective examples of air quality management; and formulation of a strategic framework for air quality management and control in the region.

The workshop format and program were designed to encourage active participation by all participants; provide a clear focus on the pollution that cities face, and the role cities can play in addressing air pollution; build on experiences and recommendations from earlier workshops and reports on air quality management and control; and share valuable experiences from outside the region as related to regional context. About 600 participants, consisting of leading decision-makers, experts, and stakeholders who influence air quality management in Asia and the Pacific Rim region, attended BAQ 2002.

### **Content of BAQ 2002**

Representatives from each of the co-organizing organizations made opening remarks. Poon Chung-kwong, President of the Hong Kong Polytechnic University presented on vehicle emission monitoring in Hong Kong and new devices being developed that attach directly to vehicles. Alan Lloyd of the California Air Resources Board discussed new legislation in California to reduce greenhouse gas emissions from automobiles. Ms. Wha-Jin Han, the Director of the APMA program, updated that status of the APMA program and expressed interest in working with CAI-Asia. Rogelio Uranza, the Chairperson of CAI-Asia, gave the final opening remarks.

Ms. Sarah Liao, the Secretary for the Environment, Transport, and Works of the Hong Kong Special Administrative Region, gave the workshop opening talk. She presented many of the emissions goals and milestones Hong Kong has already achieved: goal for a 18-percent reduction in particulate matter (PM) and 30-percent reduction in





nitrous oxides (NO<sub>x</sub>) by 2005, already reduced by 70-percent for PM and 90-percent for NO<sub>x</sub>. Much of these reductions occurred as a result of the conversion of 90-percent of the taxis to propane (LPG) fuel financed through government subsidy and incentive programs. These LPG taxis are clearly marked with stickers on at least two sides of the vehicle that a picture of a yellow daisy (see pictures). These conversions were found to save costs in fuel and maintenance. A new program is beginning to convert 5,000 minibuses to LPG fuel and electric vehicles (EVs) also utilizing government-supported financial incentives. Hong Kong is also

introducing an emissions trading pilot scheme with seven (7) locations, including Macao and the Pearl River Delta region.

The keynote addresses focused the attention of the participants on why it is important to deal with the problem of air pollution, to indicate size of the problem and the implications if no action is taken, the current status of air quality management, technologies and control in the region, and possible lessons that can be drawn from the Asia and Pacific region in air quality management as well as applications of appropriate technologies.

Mr. Fan Yuan Sheng of the State Environmental Protection Administration for the People's Republic of China, discussed sources of poor urban air quality in China and some plans for improvement. It is acknowledged that coal will always be the base of China's energy sector, but there are plans to reduce coal use to 60 percent of energy consumption by 2005. The vehicle population grows 11-13 percent annually in China with over 40 million motorcycles. Mr. Sheng referred to the "Clean Auto Action Program" to hopefully address pollution from motor vehicles.<sup>1</sup>

Hugh Friedman of the California Air Resources Board explained California's cleaning experience using regulations to force new technology development, specifically how California standards allow the choice for a cleaner fuel, such as through cleaner diesel or natural gas.

Ms. Anumita Roychowdhury from the Center for Sustainable Environment, India, believed very strongly that health impact information would drive public and government action. She felt that often public health policy ignores air pollution. The current air quality network and inventories in India were inadequate to produce quality health impact information and monitor progress. A trend in Asia is to make stronger laws but not provide institutions to support upholding of these laws. She supported investigating emissions trading as a regional policy option. Overall, regional and international partnerships should strengthen the key drivers of change (governments and accountability).

Daniel Greenbaum and Robert O'Keefe of the Health Effects Institute followed with an announcement of the launch of a health impact study in four Asian cities, "Public Health & Air Pollution in Asia." Mr. Greenbaum also believed that the main driver for change would be public health. Further, to gain the public understanding and decision-maker support, local data and studies are needed. Mr. O'Keefe

<sup>1</sup> See web site [www.vecc-sepa.org.cn](http://www.vecc-sepa.org.cn).

explained the study as a four-year effort that would address the local impact, build capacity of local scientists, and produce a final assessment report. They plan to build the organizational structure currently used by CAI-Asia.

Ms. Frannie Leautier presented on the role of the international community in reducing air pollution in Asia, including her organization, the World Bank. Of the Bank's eight Millennium Development Goals, air pollution was one of them because of its link to poverty reduction. Specifically in Bangladesh, the Bank was supporting the Dhaka Urban Transport Project and an air quality management project. The Bank also supported the Cities-Alliance Program, which partners cities for knowledge and education; while CAI-Asia is a partnership for stakeholders.

A substantial part of the overall workshop was dedicated to six (6) sub-workshops to address the different interests of participants, and to create a smaller scale environment for better interaction. I attended the most popular sub-workshop, "Motor Vehicle Emission Control," lead by Michael Walsh, International Consultant and Dr. Fu Lixin, Director of Division, Division of Air Pollution Research Department of Environmental Science and Engineering Tsinghua University.

Michael Walsh opened the sub-workshop by trying to frame the issues we were to discuss over the next several days. He mentioned fuel quality and the need to eliminate lead, use catalysts, lower sulfur content, and move to Euro I emission standards. In improving fuel quality (mainly lowering use of dirty diesel), he listed two main options for cleaner diesel and compressed natural gas (CNG) (however, suggested OEMs and avoiding conversions). And the other main theme was the importance of a good inspection and maintenance program to maintain the high performance of these advanced technology and alternative fueled vehicles.

Mr. Walsh highlighted a study done by the Southwest Research (or Resource?) Institute, released in November 2002, on school bus emissions. The study compared a conventional diesel bus; one fitted with a particulate filter and fueled by ULSD (ultra low sulfur diesel); and a CNG bus without the use of an oxidation catalyst. The study showed the CNG bus with higher emissions of NO<sub>x</sub>, nitrogen oxide (NO<sub>2</sub>), non-methane hydrocarbons (NMHC), and acetaldehyde. He compared this with an experience by CARB where CNG buses that do use oxidation catalysts and show a marked improvement in emission reduction – stressing the importance of how to do CNG right, with catalytic converters.

The other moderator of this sub-workshop, Dr. Fu Lixin, began with a presentation on the key issues address in having a successful inspection and maintenance program (I/M). He identified government coordination as important because often, Asian cities will combine emissions testing with safety testing and these with the lead environmental agency. Contrary, the I/M program needs to be independent and respected by other government entities. This independent program must have fair testing for public enforcement to be achievable. He believes combining I/M testing with vehicle registration would be a good mechanism, however Asian cities do not have consistent and congruent registration programs. Dr. Lixin proposed a fully automated, yet affordable when centralized, program run by contractors requiring renewable government certification as the best option. Then the I/M program can begin to match test procedures to be appropriate for the fleet technology. He liked the EPA I/M240 guidelines, but found the system too expensive and difficult to use and maintain. And as always, he stressed the importance of public awareness and support for any I/M program.

Dale McKinnon, of the Manufacturers of Emission Controls Association, presented data on emission reductions from diesel retrofits, including filters, and emission monitoring devices for this technology. Matthew Tsang from the Environmental Protection Department of Hong Kong continued with successful experiences in diesel retrofits in Hong Kong. A government program for these retrofits for in-use light- and heavy-duty diesel vehicles included the use of diesel oxidation catalysts and particulate matter traps.

Last year, over 34,000 vehicles were retrofitted. A trial began in December 2002 to monitor the technology experience and the demands placed on 30,000 vehicles in 18 months study duration. Hong Kong expects to retrofit all pre-Euro standard vehicles with an oxidation catalyst and/or a PM trap.<sup>2</sup>

Mr. Tsang also discussed the introduction of alternative fuels via the LPG taxi program. He said this program was so successful that they will be applying it to minibuses in the near future. He said that these vehicles would meet Euro III standards.<sup>3</sup> And this program has strengthened in-use vehicle emission inspections and promoted responsible driving and maintenance.

A very outspoken figure at the conference, Mr. Narayan Iyer from Bajaj Auto in India, spoke next about efforts to reduce pollution from 2-wheelers in India and across Asia. He presented data from the Auto Fuel Policy Committee and the Government of India (2002) that apportioned 61 percent of hydrocarbon emissions and 38 percent of PM emissions from 2-wheelers in Delhi. He also had data on 2-wheelers in other Asian cities. Mr. Iyer identified potential control measures to reduce PM emissions for 2-stroke engines, such as reducing the oil dosage and to use oxidation catalytic converter. However, he stressed the need for better studies and improved emission factors and data.

The Japan Ministry of Environment informed participants about their motor vehicle emission controls, as presented by Mr. Kotaro Kawamata. He presented emissions data and standards for NO<sub>x</sub> and PM; however, there was still a serious problem with air pollution related to heavy-duty trucks. In 2001, Japan had 74,600 hybrid vehicles and 12,012 CNG vehicles. The government offered tax incentives for emission reductions and low fuel consumption. In December 2002, the Japanese government introduced five (5) fuel cell vehicles.

Jim Lents from the University of California at Riverside instructed participants in modeling mobile source emissions and vehicle emissions monitoring. For modeling, Mr. Lents explained the factors included in emissions: air/fuel ratio, catalyst temperature, driving patterns and power demands, geographical location (local terrain), and fleet characteristics, such as age, size, technology, and composition. To monitor these factors, his modeling team has experimented in different international cities with global positioning system (GPS) tracking of vehicles, manually recording traffic with freeze-frame video technology (Santiago, Chile), and parking lot surveys (Nairobi, Kenya). Mr. Lents will have a model finalized and available on the Internet in early 2003.

The sub-workshop on mobile sources continued for a second session on the following day. These speakers addressed mostly diesel versus other fuel choices. An overview of worldwide trends in fuel quality focused on Asia, by Liisa Liuru from the International Fuel Quality center of Hart/IRI Fuels Information Services, provided statistics that set the stage for discussion.

Mario Camarsa from Enstrat International/IPIECA (International Petroleum Industry Environmental Conservation Association) gave study results of costs of installation of diesel desulfurization equipment in Asian refineries. In summary, getting these refineries to meet Euro II and III standards required a similar range capital investment but there was a giant leap in capital investment required to meet Euro IV standards (50 parts per million). This begged the question to weigh refinery configurations with lowering the sulfur content of the crude oil. While the market could absorb the cost, the immediate capital funds would be difficult to acquire. Following addressing the issue of lowering costs for reducing sulfur in diesel fuel, Ms. Nancy Yamaguchi, the President of Trans-Energy Research Associates, presented on a

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<sup>2</sup> See Appendix A. Emission Standards for New Light-Duty Vehicles in Asia.

<sup>3</sup> See Appendix A. Emission Standards for New Light-Duty Vehicles in Asia.

(LP, linear projection) model built for China to analyze costs of meeting Euro emission standards via desulfurization of diesel and gasoline fuels.

John Beale, U.S. Environmental Protection Agency (EPA), announced a partnership focused on reducing lead and sulfur in diesel fuel for vehicles, “The World Summit on Sustainable Development (WSSD) Clean Fuels and Vehicles Partnership.” He reasoned the U.S. government involvement as a desire to experiment with a program to set short-term (two-three year) goals and results from working with private sector participation in partnerships. And these pollutants were chosen because they are harmful and reductions would provide improvements in public health. The Partnership will be developing projects in specific regions to be identified as they are working with a UNEP coordinator.

As an alternative to lower sulfur diesel, Lit Mian Chan of Engine Fuels and Emission Engineering (EEFE) presented on the issues and potential benefits for CNG as a vehicle fuel. He marked other driving factors for natural gas, such as abundance of local resources and energy security. For natural gas vehicles (NGVs), he stressed the importance of quality control in conversions. In relation to NGVs, he also brought up the U.S. DOE Clean Cities Program and listed some of their efforts as providing technical assistance and travel support for conferences.

In closing, Jitu Shah of the World Bank framed diesel issues in an Asian urban environment. He emphasized public participation because people care about immediate health impacts and have the incentive to provide support. In addition, they would be the ones who enjoy the feeling of success; and he quoted one success noted by Ms. Anumita Roychowdhury, “[for people to] see stars in the Delhi sky.”

One half-day of the workshop was devoted to a “City Focus” with presentations and discussions that focus on specific cities, including Delhi, India; Shanghai, China; Hong Kong, China; Tokyo, Japan; Santiago, Chile; Busan, South Korea; Katmandu, Nepal; and Los Angeles, U.S.A. These cities have demonstrated leadership, institutionalized air quality measures, and produced clear improvements in air quality. It addressed questions asking cities to recognize how polluted they are and how much it costs them; how cities can be empowered to tackle pollution in their own backyard; how effective partnerships can be forged between national and city levels; and what are the innovative approaches at the city level in Asia and Pacific Rim areas. The last part of the city focus session was a moderated forum discussion with questions from workshop participants.

From New Delhi, India, the Delhi Transport Minister, Mr. Ajay Maken, presented updates on CNG use in Delhi. As of November 2002, there were 101 refueling stations and 120 are planned to be complete by June 2003. The compression capacity held at 9.65 kg/day and serviced 74,000 vehicles. As for future plans, Mr. Maken announced requirements for catalytic converters in April; fiscal incentives for CNG kits, and stringent emission norms would phase out older vehicles.

The Deputy Environmental Director for Shanghai, Mr. Zhang Quan, named Shanghai the economic center of China with a population of 16 million inhabitants. 45 million tons of coal accounted for 65 percent of energy consumption in 2001 and roughly half was used for power generation and half in steel plants. The city reported increasing NO<sub>x</sub> emissions due to motor vehicles between 1992 and 2001. Next year, the city would like to meet Euro II standards for vehicles.<sup>4</sup> The plan for 2003-2005 would increase energy consumption, but of fuels other than coal, reduce sulfur and black smoke emissions, and reduce other normal pollutants to or near world Health Organization (WHO) guidelines. Shanghai would like to use economic-based policies to reduce pollution, such as through a sulfur emissions trading pilot project between Shanghai and the Ghangoug Province.

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<sup>4</sup> See Appendix A. Emission Standards for New Light-Duty Vehicles in Asia.

Raymond Leung spoke on behalf of Hong Kong, a city of 6.8 million inhabitants and a high vehicle density of 271 vehicles per kilometer of road (as compared to 33 in the U.S.). The succession of high buildings and, often narrow, streets of Hong Kong produced a “street canyon” effect (see pictures) and trapped in much pollution, such as NO<sub>x</sub> and PM. However, programs to reduce pollution have made a positive effect on the local environment, such as, tax incentives for ULSD fuel – as of two years ago, it was the only type of diesel available;<sup>5</sup> and partnerships with trades on control measures – i.e. restaurants. Euro III<sup>6</sup> emission standards for vehicles were implemented last year and rigorous smoky vehicle spotter training program was in place, with penalties of HKD 1000 for vehicles violating this in-use inspection. In addition, much work has been done to control stationary sources, such as lowering NO<sub>x</sub> emissions from power plants through new lower NO<sub>x</sub> burners, desulfurization, PM filters, and new plants fueled by natural gas. For the future, Hong Kong will be investing HKD 100 million in a new rail system over the next 15 years. The air quality monitoring network included 14 stations (three roadside and 11 general) in and around Hong Kong. Canada and Vienna, Austria, and CARB signed an MOU with Hong Kong in December 2002 to collaborate on air quality monitoring and controls.<sup>7</sup>

Yuko Nishida from the Tokyo Metropolitan Government Bureau of Environment spoke about their efforts to reduce pollution from diesel fuel. Tokyo had a heavy reliance on diesel vehicles, with 650,000 vehicles in Tokyo and the number was rising. These vehicles caused nearly all of the PM emissions and 70 percent of NO<sub>x</sub> emissions. In August 1999, the “Say No to Dirty Diesel” campaign brought the issue to the public and was successful in gaining a positive response from the press, non-governmental organizations (NGOs), academics, and general public. The Governor provided strong leadership support and made a confrontation policy with the national government. Tokyo built an air quality monitoring network of 83 stations (35 roadside, 48 general) and provided hourly emissions data to the public on a website. The planned program for October 2003 will



<sup>5</sup> See Appendix B. Current and Proposed Sulfur Levels in Asia.

<sup>6</sup> See Appendix A. Emission Standards for New Light-Duty Vehicles in Asia.

<sup>7</sup> See web site [www.info.gov.hk/gia/general/brandhk/1218003.htm](http://www.info.gov.hk/gia/general/brandhk/1218003.htm).

ban all diesel vehicles that do not meet standards from the metro area; prohibit vehicle idling; require businesses with more than 200 vehicles in their fleet to have five percent of them low emission vehicles (LEVs); provide government subsidies for ULSD or replacement to CNG trucks and buses.

The Director for the National Commission for the Environment (CONAMA) in Chile, Mr. Gianni Lopez, presented about the current status in Santiago, Chile. The city's population of six million inhabitants operated 900,000 cars, 10,000 buses, 30,000 trucks, and 50,000 taxis. The main pollutants were PM<sub>10</sub>, PM<sub>2.5</sub>, and O<sub>2</sub>. In 1996-1997, natural gas was introduced as a fuel to industry, and much electric generation was switched from coal to natural gas. The government also used public awareness to drive many air quality improvements, and assisted this by providing emissions data on their website.<sup>8</sup> Goals for 2005 include reductions in PM<sub>10</sub> to 229 mg/m<sup>3</sup>, and further to 150 mg/m<sup>3</sup> by 2011. There were discussions to replace diesel fleets with natural gas or electric vehicles, but this had yet to be determined. In addition, they are considering tradable emission permits. Also, Santiago serves as the chair of the World Bank Clean Air Initiative in Latin American Cities.<sup>9</sup>

Mr. E.C. Yoo from the Busan Metropolitan Government announced plans for Busan, South Korea to increase its number of CNG buses to 1,800. In addition, while they would like to improve the air quality plans and implementation in Busan, these are heavily dependent on the national economic situation and circumstances.

Rabin Man Shrestha, the Head of Urban Environment Section in Katmandu Metropolitan City spoke about his city's main pollution sources and plans for improvement. PM<sub>10</sub> and total suspended particulates (TSP) emissions were all above international guidelines from the WHO. A large source of this was the 134,852 2-wheelers operating in 2001-2002. Steps to improve this pollution included the ban of diesel 3-wheelers in September 1999, the introduction of unleaded gasoline and move to Euro I standards in December 1999, and a ban on vehicles more than 20 years old in November 2001.<sup>10</sup> For the future, Katmandu is looking to promote the use of battery-powered electric vehicles and increase air quality monitoring stations. However, Katmandu suffers from a lack of plans, enforcement regulations and standards.

The "City Focus" talks were followed by a "City Forum" where perspectives from difference city stakeholder groups could speak on behalf of their constituents. National government agencies, the legal community, and the urban poor were represented by speakers from Indonesia and the Philippines. Other perspectives gave more relevant information, as detailed in the paragraphs below.

The civil society perspective was given by Ms. Anumita Roychowdhury from CSE India. She spoke about city governance and clean air, how to learn from each other in Asia. She described many cities as hesitant to use constitutional powers to act locally and that much governance was too rigid to allow flux in decision making and institutions too splintered to allow for implementation. She identified how civil society has steered much change in Asian cities, such as Tokyo in its dirty diesel campaign. Also, successes in public-private partnerships have involved civil society in policymaking, such as with solving problems with two- and three-wheelers. This was a case where Asian cities found their own solution to an Asian problem and demonstrated leadership.

The perspective of a development agency was given by Mr. Charles Melhuish of the Asian Development Bank (ADB). He distinguished the need for political willingness and sustained budget allocations to affect

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<sup>8</sup> See web site [www.conamarm.cl](http://www.conamarm.cl).

<sup>9</sup> See web site <http://www.worldbank.org/cleanair/cailac/index.htm>

<sup>10</sup> See Appendix A. Emission Standards for New Light-Duty Vehicles in Asia.

development. And the importance of governance was extended to laws and regulations in the need for an ability to regulate and enforce.

A representative from Shell Global Solutions, Ean-Bee Loke, provided the private sector perspective. He labeled CNG and LPG “niche fuels.” In relation to Asia, he recommended gas-to-liquid (GTL) diesel as more cost effective in the long-term because of infrastructure. In particular, one presentation slide compared cleaner diesel versus CNG and played clear preference to diesel fuel.

Presenters during Poster Sessions mounted their papers on a poster for viewing by workshop participants. Presenters made themselves available for one hour and 30 minutes to answer questions from participants.

Members of the private sector exhibit specific technologies, products or services related to ambient air quality monitoring or to controlling pollution from mobile or stationary sources of pollution. Exhibitors included major corporate sponsors of BAQ 2002 (e.g., Diamond and Platinum Sponsors); and workshop organizers. The exhibition ran for the entire duration of the workshop in the hallway just outside of the conference meeting rooms.

BAQ 2002 organized technical visits for participants following the closing session of the conference, including trips to a bus maintenance depot and vehicle emissions testing center in Kowloon Bay; air quality monitoring stations in Central Hong Kong and Tung Chung; a Towngas plant in Taipo; and power plants in Lamma and Tapshekkok.

For the workshop closure, three speakers were invited to deliver a closing address. These were senior persons who had demonstrated keen interest in the issue of air quality management, either from a government organization within the Asian region or from a private sector body outside the region. Sam Coulson, Regional Manager – Asia Pacific for the Ford Motor Company, wrapped much of the week into his presentation on establishing partnerships to improve air quality between industry, government, and the private sector. He drew on Ford’s programs and experience in Asia as examples of how workshops and recommendations have lead to private-sector led programs, i.e. Ford work in Thailand, 1998. Dr. Supat Wangwongwatana, Deputy Director General of the Pollution Control Department in Thailand, identified many challenges ahead in air quality management in Asia. Robert Law echoed Dr. Supat’s theme and narrowed the focus to the challenges for Hong Kong.

### **Side Events to BAQ 2002**

Several side events were held in conjunction with the BAQ 2002 Workshop, including a Regional Policy Dialogue to review the strategic framework for air quality management in Asia being developed by APMA in coordination with CAI-Asia; work group meetings of the Clean Air Training Network for Asia (CATNet-Asia); and the General Assembly of CAI-Asia was held immediately after the BAQ 2002 workshop. The main items on the agenda were the approval of Business Plan 2003 and the proposed merger of CAI-Asia with APMA Project.

On the final day, a meeting was held to discuss the next steps in the implementation in Asia of the Partnership for Clean Fuels and Vehicles. This Partnership was launched at the WSSD in Johannesburg in August 2002 by UN-DESA, the United Nations Environment Programme (UNEP), U.S. EPA and the International Fuel Quality Center. The meeting reviewed the roles that different organizations, including CAI-Asia, could play in facilitating the Partnership in Asia.

Clean Cities International presented a brief slideshow about its program, international experience with highlights of activities in Asia, and possible opportunities for information sharing and building a relationship with the Partnership for Clean Fuels and Vehicles. While the Partnership has clearly defined

its priorities to focus on unleaded gasoline and lowering sulfur content of diesel fuel, Clean Cities International expressed its common commitment to international development and support for clean transportation.

Over 20 organizations presented on their efforts in Asia to improve air quality, their interest in the Partnership, and opportunities for assistance and collaboration. This provided a great opportunity to learn more about specific efforts not discussed during other conference sessions. For example, details about the Philippine program revealed their 2003 plans to have a pilot test with Swisscontact<sup>11</sup> and others on LPG 3-wheelers and develop CNG public awareness. Also, Lee Schipper from EMBARQ planned to choose a city in China to apply its model, data, and analysis used in Mexico City.

This session also identified new potential partners for Clean Cities International. Dr. Bryan Wilson, Professor and Research Director of the Engines and Energy Conversion Laboratory at Colorado State University showed examples of his work in 2-stroke engine retrofits with direct injection. As a university, his laboratory could play a role in providing much needed high-quality emissions data, and is funded to provide project assistance. Also, Kevin Park introduced the new Asia-Pacific NGV Association. While they have no members yet, this will be an important contact in the future. Lubrizol Project Manager, Jim H. Li, expressed interest in becoming a private-sector stakeholder of Clean Cities International and also in working on Clean Cities International project with the U.S. Trade and Development Agency (TDA).

In follow-up documents outlining expressions of interest circulated to those who attended the meeting for the Partnership for Clean Fuels and Vehicles in Asia, Clean Cities International was listed as a presenter and informational points about the Clean Cities International program were included.

This conference also served well for informal meetings with Clean Cities' regional contacts. I met with two Clean Cities-sponsored participants, Mr. Ali Nurallah and Mr. Abedin, from Bangladesh who updated the status of their CNG program. They plan to purchase 300 CNG buses very soon, 200 of them via tender, funded by the ADB, from two (2) companies (unsure, but suggested Volvo and an Indian company). Also, they are building 32 stations in and around Dhaka to expand the refueling network – 10 new stations came on just recently and 15 more are coming soon. I also had the occasion to meet Director General of the Department of Environment for Bangladesh, Mr. Hedayetul Islam Chowdhury, over a coffee break. He is interested in being contacted by Marcy Rood, to be informed of Clean Cities work in Bangladesh.

I also met Mr. Benito A. Bernardo, Jr., Vice President – Corporate Affairs, Pilipinas Shell Petroleum Corporation. He spent much time with the delegation from the Philippine government. He said that Shell supported all alternative fuels and would support whichever fuel the Philippine government chose to lead with. They were willing to help with cost analysis; however, he hoped that the government would focus on the issue and provide proper support and funding, and not ask the private sector to absorb all of the costs (for example, building a natural gas infrastructure).

Discussions with the Philippine delegation (specifically, Ms. Teresita Borra) reinforced their development of a plan for natural gas vehicles. California Bus Lines was on track to purchase 100 natural gas-fueled buses from an undetermined company (although suggested was Blue Bird) and a refueling station built by July. They were still interested in working with the Clean Cities Program. Ms. Borra planned to return to Manila, discuss collaboration with Mr. Francisco Benito, and email Marcy Rood with a list of opportunities.

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<sup>11</sup> See web site [www.swisscontact.org/](http://www.swisscontact.org/).

## **Recommendations, Upcoming Events, and New Resources**

### **Recommendations**

#### **India**

1. Support NAFTC to the upcoming training partnership with SIAM (January 2003);
2. Continue to share information with parties in India, such as technical analyses, U.S. NGV product guides, etc.;

#### **Thailand**

1. Incorporate new information received about Thailand's needs;
2. Follow-up with representatives in Thailand regarding the potential collaboration on information sharing efforts, technical assistance for emission data gathering and analysis on multiple alternative fuels;
3. Follow-up with representatives in Thailand and US-AEP (Mr. Jeff Bowyer) regarding the potential collaboration on a training symposium in coordination with USAID (proposal already in development);

#### **Bangladesh**

1. Work with USAID and ASG Renaissance to support upcoming training for NGVs in Bangladesh (Scoping Trip, January 2003);
2. Follow-up with representative who expressed interest in the Clean Cities Program, Director General of the Department of Environment for Bangladesh, Mr. Hedayetul Islam Chowdhury;

#### **Philippines**

1. Continue to explore the development of a Clean Cities program in Manila;
2. Respond to expected incoming requests for assistance from our contacts at the Philippine Department of Energy (Ms. Teresita Borra and Mr. Francisco Benito);
3. Investigate Manila stakeholder group, follow activities, possibly attend workshops and provide technical assistance;

#### **Building Private Sector Stakeholders**

1. Respond to Lubrizol's interest in coming a private sector partner via Mr. Jim H. Li;
2. Add contact(s) to the Clean Cities List serve;

#### **Working with and Leveraging Funding from Other Collaborators**

1. Respond to Colorado State University's (CSU) request for collaboration via Dr. Bryan Wilson;
2. Consider current projects and opportunities for CSU involvement;
3. Explore how DOE can leverage CSU-offered funds;
4. Add contact(s) to the Clean Cities List serve;

#### **Consider Participation in Other International Partnerships and Institutions**

1. Follow the progress of The World Summit on Sustainable Development (WSSD) Clean Fuels and Vehicles Partnership and consider avenues for collaboration with the Partnership and its U.S. EPA coordinators (Ms. Jane Metcalfe);
2. Continue to follow Partnership for Clean Fuels and Vehicles in Asia (via Cornie Huizenga and Herbert Fabian), participate in their discussions and development, offer information and materials for posting on their website, and consider possibility of joining the Partnership;
3. Follow the development of the new Asia-Pacific NGV Association (via Mr. Kevin Park) and add contact(s) to the Clean Cities List serve;

### **Increasing Awareness of Clean Cities International**

1. Add many contacts made at BAQ 2002 to the Clean Cities List serve;
2. Increase the frequency of Clean Cities List serve announcements;
3. Target Clean Cities List serve announcements to countries, regions, and stakeholder groups;
4. Promote Clean Cities Conference on many international calendars of events and websites.

### **Upcoming Events**

January 18-19, 2003: *Diesel Days*, Washington DC, sponsored by the World Bank, CAI-Asia, and CAI-Latin America, see web site

[http://www.worldbank.org/cleanair/global/learningactivities/diesel\\_days/index.html](http://www.worldbank.org/cleanair/global/learningactivities/diesel_days/index.html).

February 21-23, 2003: *Workshop on Diesel Study*, Bangkok, Thailand, sponsored by the Thailand Pollution Protection Agency, see web site [www.pcd.go.th/about.cfm](http://www.pcd.go.th/about.cfm), contact Dr. Supat Wangwongwatana, email [Supat.W@pcd.go.th](mailto:Supat.W@pcd.go.th).

March 23-25, 2003: *International Transport Workshop*, Naguya, Japan, sponsored/organized by OECD Environment and the Government of Japan, see web site [www.oecd.org](http://www.oecd.org).

December 2003: *BAQ 2003*, Location TBD (Proposed: Busan, South Korea), sponsored by CAI-Asia, ADB, and others.

### **New Resources**

#### *Reducing Vehicle Emissions in Asia*

This section of the ADB web site was the result of an ADB project called "Action Plans for Reducing Vehicle Emissions." The project created a forum for governments, NGOs, development agencies, and the private sector to discuss mobile sources of air pollution in Asia, and develop acceptable policy guidelines. Project outputs and workshop presentations are also available on this site. See web site, [www.adb.org/vehicle-emissions/](http://www.adb.org/vehicle-emissions/)

#### *IPIECA Urban Air Quality Management, Volume 2*

This Volume is the second in the International Petroleum Industry Environmental Conservation Association (IPIECA) Urban Air Quality Management (UAQM) series and focuses on the role of emission inventories in the process of developing sound air quality management programs. The report discusses the principles behind emission inventories and describes the emission inventory model, or IPIECA Toolkit. The report also gives illustrations of where the Toolkit has been used and the process for its integration into air quality programs. See web site, <http://www.ipieca.org/publications/fuels.html>.

## Appendix A. Emission Standards for New Light-Duty Vehicles in Asia

Country	95	96	97	98	99	00	01	02	03	04	05	06	07	08	09	10
EU	Euro 1	Euro 2				Euro 3					Euro 4			Euro 5		
Bangladesh									Euro 2 (under discussion)							
Cambodia	No specific emission standards for new vehicles															
Hong Kong	Euro 1	Euro 2				Euro 3					Euro 4					
India* (Delhi & other cities)					E1	Euro 2					Euro 3					
India* (Entire Country)											Euro 2				E3	
Indonesia									Euro 1 (proposed)		Euro 2 (prop)					
Malaysia			Euro 1			Euro 2										
Nepal						Euro 1										
Pakistan																
Philippines									Euro 1							
PR China								Euro 1		Euro 2						
Singapore	Euro 1							Euro 2								
Sri Lanka									Euro 1							
Taipei, China						US Tier 1								US Tier2 for diesel**		
Thailand***	Euro 1						Euro 2		Euro 3					Euro4		
Vietnam	Gasoline			Euro 1							Euro 4 (under consideration)					
	Diesel										Euro 1	Euro 2	E3	E4		

\* Euro 2 introduced in Mumbai, Kolkata and Chennai in 2001. Euro 2 in Bangalore, Hyderabad, Khampur, Pune and Ahmedabad in 2003, Euro 3 to be introduced in Delhi, Mumbai, Kolkata, Chennai, Bangalore, Hyderabad and Ahmedabad in 2005

\*\* Gasoline vehicles under consideration

\*\*\* Heavy duty diesel standards: up to 1999: Euro 1, 2000 – 2005 Euro 2, 2006 onwards Euro 3

## Appendix B. Current and Proposed Sulfur Levels in Asia

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Bangladesh							5000									
Cambodia					2000											
PR China	5000		2000													
Hong Kong, China		500					50									
India	5000				2500	***				500					350	
Indonesia	5000															
Japan	500									50		10				
Korea	500															
Malaysia	5000		3000				500 marketed									
Nepal																
Pakistan							4600		2500 under consideration							
Philippines	5000					2000			500							
Singapore	5000		500													
Sri Lanka								3000								
Taipei, China	500															
Thailand	2500			500												
Vietnam	10000							2000		500						
United States	500														15	
EU					350					50				10		

> 500 ppm

51 – 500 ppm

< 500 ppm

## Appendix C. Contact Information

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SIAM is the apex national body representing the leading vehicles and vehicular engine manufacturers in India. SIAM plays a proactive role on all issues promoting the sustainable development of the Industry. It is an important channel of communication for the automobile industry with the Government, national and international organizations. It disseminates information concerning automobile industry through publications, reports, seminars and conferences.

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A subsidiary of Bangladesh Oil, Gas and Mineral Corporation (Petrobangla), RPGCL was organized as a company to convert vehicles to compressed natural gas (CNG) and to popularize the use of CNG. Later, the company was also given the responsibility of extracting LPG from the wet gas stream, and refining for bottling and marketing.

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